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⁽⁶⁷⁾ Summary: none

⁽¹⁴⁾ Title
**Sport shoe, in particular
a Tennis Shoe**

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a Tennis Shoe

Description

The invention concerns a sport shoe, in particular, a tennis shoe, with a resilient, plastic outer sole, through which, open aeration channels have been provided, penetrating from the outer side to the inner side.

The problem of the inner aeration of sport shoes have been a matter of concern to shoe manufacturers for a considerable time, because it is specifically in sport shoes that the heat generation of the foot is substantial because of sport activities. Further, heat generates itself particularly in the plastic outer sole, as a result of the continual material working, which arises upon the rolling motion plus the occurring friction. In particular, in the case of such sport shoes, which are designed for use on hard playing surfaces, for instance, tennis shoes, and which, on this account, have a relatively thick and soft outer sole, the inevitable heat insulation propensities for these soles leads to a heat concentration, which expresses itself in a considerable build up of sweat. Disregarding the fact, that the formation of sweat detracts from the wearing comfort and fosters the development of foot maladies, the upper material of the sport shoes, whether this is leather or textile, is sorely attacked thereby and deteriorates too quickly.

A multiplicity of proposals have been presented to conduct air to the foot through the upper and through the sole, in order to restrict the heat development and the thereby arising sweat buildup. Thus, for a long time, it has been customary, to provide on the upper in the inner ankle area, one or more aeration openings and to perforate the membrane, in order to give air an entry to the foot. Experience, however, has shown, that this kind of aeration remains in great measure without value.

It is already a known practice, to provide aeration openings on the edges of the sole, which, connect with air flow channels of the outer and insoles, with the intention of bringing air to the sole of the foot through channels opening on the upper side of the insole (see FR-PS 1 295 561). This and other proposals, which aim for the same result, i.e. to cool the heavily exercised sole of the foot area, have, up to this time, brought no effectual, decisive solutions to the problem.

Thus, the invention has the purpose of proposing a shoe aeration, which retards the disadvantageous buildup of sweating in a substantially better way than previously and also, at least to a certain extent, makes possible a flow of air in the interior of the shoe. In accord with the invention, the achievement of this purpose is to be reached by a sport shoe of the kind mentioned in the introductory passages, in that aeration channels are arranged in the sole along a line which runs under the hollow space at the base of the toes, i.e. between the ball of the foot and the balls of the toes.

With this proposal, the invention arises from the recognition, that no value can be found in a direct input of air to those areas of the foot, which are in close contact with the adjacent parts of the shoe, and which, as a rule, are the most stressed. The reason for this is that the air entry openings on the shoe interior, when in use, are continually tightly closed by the adjacent foot. This is true, above all, for the area of the ball of the foot, on which the heat generation makes itself known particularly strongly, and in the area of the instep, because at those points, due to the lacing-up of the sport shoe, care is taken that the shoe fits skin-tight on the foot. Furthermore, it is obvious, that even in the remaining sole areas, wherein the foot finds itself under stress, a inflow of air in any mentionable amount, is not possible. By means of the proposal made here, with the arrangement of the aeration channels on the sole side along that line, which runs under the hollow space under the toes of the sports person, it becomes possible to actually bring air into the interior of the shoe. This is possible because the aeration channels on the shoe interior are continually open. Since, contrary to the action of the balls of the foot, the toes, even with tightly fitting shoes, carry out, upon a rolling occurrence, a movement relative to the shoe, which the balls of the foot do not.

By this invented action, the desired active support of the air flow, which has been desired, but never achieved, because of inappropriate arrangement of the aeration channels, now becomes possible. The air which enters into the shoe, and becomes saturated with moisture therein, can now be expelled to the outside through the aeration channels and in this way, take the humidity with it. Since, by means of these measures, the toe area is well cooled, consequently, heat is also indirectly withdrawn from the ball area of the foot, so that the desired cooling effect is achieved.

In accord with another especially advantageous embodiment, for which independent protection is claimed, in the edges of the sole of the shoe toe, forward aeration channels are provided, which open above the insole. The aforementioned and described principle is made use of with these forward aeration channels, that is, to introduce the air in locations in the interior of the shoe which are not covered by the foot and thereby closed. These channels substantially increase the effect of the aeration of the sole aeration channels, because they create the possibility of a through-flow, which is enhanced by the said toe motion. Obviously, the small restraining pressure which occurs upon movement at the point of the shoe aid the said through-flow.

A further measure, to increase even more the targeted cooling effect, is found in making the apron of the shoe upper and the tongue out of a strongly air permeable fabric, in particular a netlike weave. Since, on the instep, that is, in the area of the tongue, the shoe is normally tightly bound to the foot, this precludes any air flow. As a result of the arrangement of a highly permeable fabric, there exists, however, a possibility for evaporation for the developing perspiration. In the area of the toes, on the other hand, such a fabric opens a further flow possibility for the air entering the aeration channels through the sole edges or the forward aeration channels. It is thus, by means of the combination of the three described aeration measures, that assurance is given, that the humidity arising from the foot, can be actually transported to a great extent out of the shoe.

The action of the air-permeable fabric in the toe section and in the tongue area, permits being increased if open weave is employed, in which two cover layers are bound together by fabric looping and by this means, can also maintain a distance from one another. In this matter, in the fabric itself a very permeable interposed space is created, in which, up to a certain limit, air flow can occur.

Experience with the invented sport shoe, in which the forward and sole aeration channels are provided with a highly air-permeable channels plus an air-permeable fabric in the apron, that actually a substantial continuing aeration of the shoe interior and a removal of heat therefrom takes place. Up to now, this is an advantage which could not be attained.

Since, in the course of tennis play, the roll of the foot takes place with particular force, this leads, to a situation in which in the ankle area and below the joint, the upper somewhat loosens toward the foot, this, of itself, achieves an aeration of the side of the foot. Special aeration measures, on this account, are not of such essential importance in this part of the shoe as they were in the former shoe, especially in the sole area.

Further practical and advantageous embodiments of the invention are made evident from the following description with the aid of the attached drawings, as well as further subordinate claims. The drawings show in:

Fig. 1 a longitudinal section along the line I-I in Fig. 2 through the forward part of an invented sport shoe;

Fig. 2 A top view onto the forward part of the shoe in accord with Fig. 1 and

Fig. 3 A view from below, showing the forward part of the shoe in accord with the Figures 1 and 2, from which the position of the aeration openings become evident.

In the case of the sport shoe depicted in the drawings, the concern is with a tennis shoe with a so-called shell sole 1 of polyurethane foam, which peripherally encompasses an upper 3, which upper is bound to an insole 2 by means of a shell edging 4. The shell sole 1 is advantageously connected to the upper 3 by simultaneous molding with said insole.

As is especially evident from Fig. 3, the inner ball area and the toe area of the shell sole 1 is made, on the ground contact side by means of a molded foresole 5, from an especially wear resistant plastic material, which could be a cross-linked polyurethane with the designation Vulkollan, which at the molding time of the shell sole 1 is immediately engulfed by the polyurethane foam and in this manner is united with the shell sole 1. The molded foresole 5 possesses in the area of the inner ball, a known, ring profile 6 (Fig. 3), which is limited to the location, and is otherwise provided with an optional profiling (not shown), which agrees with that of the shell sole 1. On its back end, the molded foresole dwindles out at 7, so that at the transition of the molded foresole material, there is compensation is made for the non-uniformity of the sole.

The molded foresole 5 is penetrated by four aeration channels 8. These channels have corresponding respective openings in the insole 2 and in a possibly inlaid (not shown) auxiliary insole. As far as the openings in the said auxiliary insole, these can be eliminated, if these consist of a substantial mass of air-permeable open-work material, such as a netting, as will be subsequently be explained below. The aeration channels 8 are on the ground contact side of the molded foresole 5, inset with a greater diameter at this point and containing screen inserts 9, which repress the intrusion of dirt particles into the shoe interior, but do not diminish the desired ventilation (see the older proposal P 25 33 622.5 of the applicant). As Fig. 3 shows, the aeration channels 8 are arranged along a line 10, which runs beneath the hollow space 11 under the toes (Fig. 1). That is to say, the line between the ball of the foot and the balls of the toes of the user. The separating distance of the line 10, from the forward edge of the shoe changes itself, naturally, in accord with the size of the shoe and in lesser measure also with the currently selected shape of the shoe.

This said separating distance, as Fig. 3 also shows, is in no way a constant, but, in accordance with the decrease in toe length from the big toe to the little toe, becomes less toward the outside. In the case of a German shoe size 7 the maximal distance of the line 10 from the forward edge of the shoe, for example, approaches 6 cm.

The molded foresole 5 forms additionally, also a part of the elevated shell rim 4 of the shell sole 1 and possesses in this edge at the point (6) of the toe, forward aeration channels 15, which, from their outer entrance, incline themselves upward and open in the shoe interior above the insole 2. The outer openings of the forward aeration channels 15 are circumferentially surrounded by an annular bulge and partially covered by a thin lip 17 which is an integral part of the upper rim of the molded foresole 5. By means of the combination of these three measures, namely, the inclined upward path, the annular bulge about the outer opening, and the partial covering by the lip, the entrance of dirt particles into the forward aeration channels 15 is restricted.

Above the upper edge of the molded foresole 5, runs the shell rim 4 to an abrasion protecting bulge 18, which protects the toe wrap-around from the premature wear. Such wear is frequently brought about in tennis play by the dragging of the leg carrying, for that instant, no weight.

As is particularly to be seen in Fig. 2, the depicted tennis shoe is fashioned in the Derby Cut style, that is, possesses side located, upper parts 20 which carry the lacing leather, which, with a separate apron 21, proceeds into becoming the tongue 22, and is sewed by the strip 23. This upper design permits the lacing to be brought considerably to the fore, without the need to give consideration to the formulation of the apron. From this situation, an advantage arises, in connection with the following explanation of raw material selection for the said apron 21, that an especially long wear life and favorable shaping of this apron 21 can be achieved.

The apron 21 is of one piece with the tongue 22, and made of a highly air-permeable material, for instance, Nylon net or fabric of open weave, in which fabric two cover layers 21' are bound by standing loops 21" and a thus kept at a separating distance from each other.

The apron 21 is at some 24 sewed to the insole at 25, that is, and is perforated at the openings of the forward aeration channels 15. The open material of the apron 21 and the tongue 22 upon requirement for increasing foot comfort, can be underlain by a highly air-permeable lining layer.

As stated in the opening passages, the foot of a wearer - depicted in Fig. 1 as a dashed outline - because of the tight lacing of the upper 20, is in close contact with the shoe on this upper 20 and the tongue 22 as well as also on the area of the ball of the foot. However, the toes carry out upon a roll procedure, a continuous movement, which leads to a state wherein, by means of the sole side aeration channels 8, air is forced in and out. Since the sole side aeration channels 8 open into the toe hollow space 11, they are always open, so that in every movement phase, air can flow.

This is also valid for the forward aeration channels 15, since these also open into zones which cannot be closed off. Because, as is known, the big toe supports itself in any case to the fore (even with tight shoes), while, up to the little toe, a hollow space is available. The aeration channels 8 and 15 create, thus, in connection with the air-permeable apron 21 a ventilation of the interior of the shoe, through which occurring moisture can be transported away, because of the in/out transported air, in other words, because of an air flow. Also, through the air-permeable tongue 22, moisture can evaporate and the foot is maintained cool at the instep.

It is self explanatory, that additionally to the described aeration measures of the above embodiment example, further known aeration methods in the upper ankle or the like can be employed. Also, the proposal made here is not limited to tennis shoes, but also for such sport shoes as find their application in gyms and courts.

The shell edge 4 of the shell sole 1 can exhibit a substantially thinner wall thickness, at the height of the seam 23, or in a location shortly before this, for example for a length of 1 cm to the sole, to make creasing, or bending zones. By this means, the often observed breaks in the shell edges 4 from the upper at this location are restrained.

An aeration possibility in the ankle area, can be found in the length of the upper, upon which the three stripe logo of the applicant is sewed, this area likewise can be made of the open weave fabric of the apron 21.

The sport shoe can be provided with a leather as well as a linen upper.

Beyond the above, instead of the abrasion resistant bulge over the apron 21, strips of leather or the like can be sewed thereon, which, for example run from front to back under the upper part 20.

Claims

Claimed is:

1. A sport shoe, in particular, a tennis shoe, having a resilient, plastic outer sole, in which aeration channels are provided, penetrating from outside of said outer sole and opening into the foot side, therein characterized, in that the aeration channels (8) are arranged along a line (10), which runs under the hollow spaces (11) beneath the toes, i.e., between the ball of the foot and the balls of the toes.
2. A sport shoe, especially in accord with Claim 1, therein characterized, in that, on the edge of the sole (4) of the point of the shoe over the toe area, forward aeration channels (15) are provided which open above the insole (2) or, in some cases, above an inlaid auxiliary sole.
3. A sport shoe in accord with Claim 2, therein characterized, in that the forward aeration channels (15) run upwardly inclined from the outside.
4. A sport shoe in accord with one of the Claims 2 and 3, therein characterized, in that the outer openings of the forward aeration channels (15) are circumferentially enclosed by an annular bulge (16) and/or, are partially covered from above by an adjacently disposed, overlapping lip (17).
5. A sport shoe in accord with one of the Claims 1 to 4, therein characterized, in that the aeration channels possess a diameter of at least 3 mm.
6. A sport shoe in accord with one of the Claims 1 to 5, therein characterized, in that the sole side aeration channels (8) contain screen inserts.

7. A sport shoe in accord with one of the Claims 1 to 6, therein characterized, in that the apron (21) of the shoe upper (21) and the tongue (22) exclusively consist of a highly air-permeable fabric, especially an open weave fabric, which, if necessary, is provided with a highly air-permeable lining.
8. A sport shoe in accord with one of the Claims 1 to 7, therein characterized, in that the sole portion which carries the sole side and the forward aeration channels (8, 15) comprises a molded foresole (3) of greater wear resistance, the said foresole being bound to the remaining part of the sole (1).
9. A sport shoe in accord with Claim 8, therein characterized, in that the molded foresole covers the inner ball zone and merges rearward into the outer sole (1) in a self thinning lap (7).
10. A sport shoe in accord with Claim 7, therein characterized, in that the shoe upper is cut in Derby style and the upper side part (20) extends itself forward up to a distance of about 4 cm from the forward edge of the shoe.
11. A sport shoe in accord with Claim 7 or 10, therein characterized, in that the apron (21) and the tongue (22) are of one part.

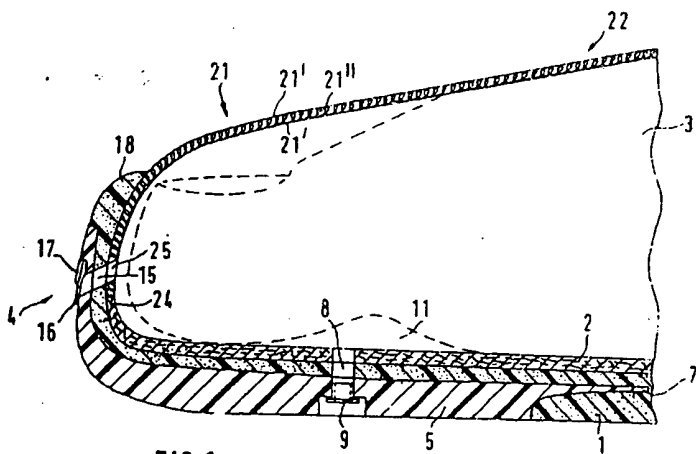


FIG. 1

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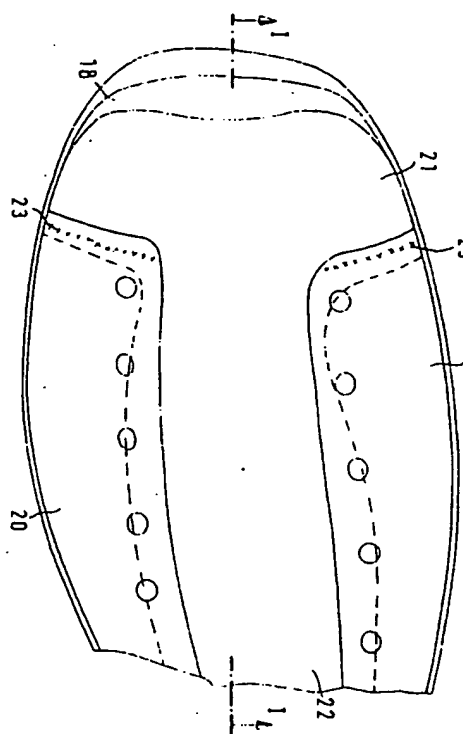


FIG. 2

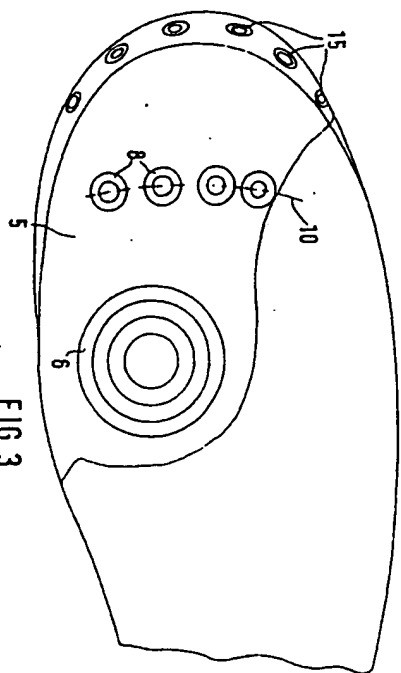


FIG. 3

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